
HVAC: Hydronic System Measures

Description

This proposed change adopts hydronic system measures based on ASHRAE/IES Standard 90.1-2001, §6.3.4, including:

Design for variable flow (variable speed drives),

Pump isolation,

Chilled- and hot-water reset,

Isolation valves for water-loop heat pumps and miscellaneous water-cooled equipment.

The current ASHRAE/IES Standard 90.1-2001 requirements are as follows:

6.3.4 Hydronic System Design and Control. HVAC hydronic systems having a total pump system power exceeding 10 hp shall meet provisions of 6.3.4.1 through 6.3.4.4.

6.3.4.1 Hydronic Variable Flow Systems. HVAC pumping systems that include control valves designed to modulate or step open and close as a function of load shall be designed for variable fluid flow and shall be capable of reducing pump flow rates to 50% or less of the design flow rate. Individual pumps serving variable flow systems having a pump head exceeding 100 ft and motor exceeding 50 hp shall have controls and/or devices (such as variable speed control) that will result in pump motor demand of no more than 30% of design wattage at 50% of design water flow. The controls or devices shall be controlled as a function of desired flow or to maintain a minimum required differential pressure. Differential pressure shall be measured at or near the most remote heat exchanger or the heat exchanger requiring the greatest differential pressure.

Exceptions to 6.3.4.1:

(a) Systems where the minimum flow is less than the minimum flow required by the equipment manufacturer for the proper operation of equipment served by the system, such as chillers, and where total pump system power is 75 hp or less.

(b) Systems that include no more than three control valves.

6.3.4.2 Pump Isolation. When a chilled water plant includes more than one chiller, provisions shall be made so that the flow in the chiller plant can be automatically reduced, correspondingly, when a chiller is shut down. Chillers referred to in this section, piped in series for the purpose of increased temperature differential, shall be considered as one chiller. When a boiler plant includes more than one boiler, provisions shall be made so that the flow in the boiler plant can be automatically reduced, correspondingly, when a boiler is shut down.

6.3.4.3 Chilled and Hot Water Temperature Reset Controls. Chilled and hot water systems with a design capacity exceeding 300,000 Btu/h supplying chilled or heated water (or both) to comfort conditioning systems shall include controls that automatically reset supply water temperatures by representative building loads (including return water temperature) or by outside air temperature.

Exceptions to 6.3.4.3:

(a) Where the supply temperature reset controls cannot be implemented without causing improper operation of heating, cooling, humidifying, or dehumidifying systems.

(b) Hydronic systems, such as those required by 6.3.4.1, that use variable flow to reduce pumping energy.

6.3.4.4 Hydronic (Water Loop) Heat Pump Systems. Each hydronic heat pump shall have a two-position automatic valve interlocked to shut off water flow when the compressor is off."

This measure would expand the requirements in 6.3.4.4 to include miscellaneous water-cooled equipment that is tied to a building's condenser water system, such as equipment specifically for cooling a computer room.

Benefits

These measures would primarily save energy while having minimal impact on demand. It is unknown what the effect of TDV would be on the stringency of these measures.

Environmental Impact

These measures provide energy savings with no impact on water usage or indoor air quality.

Type of Change

These changes would be new prescriptive requirements, and also involve changes in the ACM and ECM Manuals.

Measure Availability and Cost

These measures deal with equipment and controls that are readily available in the marketplace. Variable speed drives cost approximately \$250/hp installed. Pressure sensors for variable flow control of pumps have an estimated cost of \$1,500 per system, and 2-Position valves cost about \$600 installed.

These costs will be refined if this measure meets the initial screening criteria.

Useful Life, Persistence and Maintenance

These measures are expected to have reliable performance throughout their lives. Aside from periodic recalibration of control sensors, these measures require little or no maintenance. Variable speed drives and control components should last approximately 15 years.

Performance Verification

During startup, the controls contractor should verify the control systems in these measures (variable speed drives and temperature reset controls).

Cost Effectiveness

ASHRAE/IES Standard 90.1-1999 adopted these measures using lower energy costs than Title 24. A simple life-cycle cost analysis will be completed to determine if this measure should be adopted in the *Standards*. For the variable speed drives and the automatic 2-position isolation valves, DOE 2 simulations and a life-cycle cost analysis will be completed using the current CEC economic criteria. These measures largely represent off-peak savings. It is unclear what the impact of TDV would have on their stringency.

Analysis Tools

As described in the section above, DOE-2 simulation will be used.

Relationship to Other Measures

N/A.

Bibliography and Other Research

ASHRAE/IES Standard 90.1-2001.